



EXPLORE SPACE TECH

QUICK INTRO TO SMALL SPACECRAFT WITHIN SPACE TECH

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SPACE TECHNOLOGY MISSION DIRECTORATE STRATEGIC THRUSTS

THRUSTS

OUTCOMES

CAPABILITIES



Lead

Ensuring American global leadership in Space Technology

- Lunar Exploration building to Mars and new discoveries at extreme locations
- Robust national space technology engine to meet national needs
- U.S. economic growth for space industry
- Expanded commercial enterprise in space



Go

Rapid, Safe, & Efficient Space Transportation

- Develop nuclear technologies enabling fast in-space transits.
- Develop near zero boil off Cryogenic Storage, Transport, and Fluid Management technologies for surface and in-space applications.
- Develop Advanced Propulsion technologies that enable future science/exploration missions.

- Advanced Propulsion
- Cryogenic Fluid Management



Land

Expanded Access to Diverse Surface Destinations

- Enable Lunar/Mars global access with ~20t payloads to support human missions.
- Enable science missions entering/transiting planetary atmospheres and landing on planetary bodies.
- Develop technologies to land payloads within 50 meters accuracy and avoid landing hazards.

- Human & Robotic Entry, Descent, and Landing
- Precision Landing



Live

Sustainable Living and Working Farther from Earth

- Develop exploration technologies and enable a vibrant space economy with supporting utilities and commodities
 - Sustainable power sources and other surface utilities to enable continuous lunar and Mars surface operations.
 - Scalable ISRU production/utilization capabilities including sustainable commodities on the lunar & Mars surface.
 - Technologies that enable surviving the extreme lunar and Mars environments.
 - Autonomous excavation, construction & outfitting capabilities targeting landing pads/structures/habitable buildings utilizing in situ resources.
- Enable long duration human exploration missions with Advanced Life Support & Human Performance technologies.

- Advanced Power Systems
- Advanced Thermal Systems
- In-situ Propellant and Consumable Production
- Advanced Materials, Structures, and Manufacturing
- Advanced Life Support and Human Performance



Explore

Transformative Missions and Discoveries

- Develop next generation high performance computing, communications, and navigation.
- Develop advanced robotics and spacecraft autonomy technologies to enable and augment science/exploration missions.
- Develop technologies supporting emerging space industries including: Satellite Servicing & Assembly, In Space/Surface Manufacturing, and Small Spacecraft technologies.
- Develop vehicle platform technologies supporting new discoveries.

- Advanced Avionics
- Advanced Communications & Navigation
- Autonomous Systems and Robotics
- On-orbit Servicing, Assembly, and Manufacturing
- Small Spacecraft

Note: Multiple Capabilities are cross cutting and support multiple Thrusts. Primary emphasis is shown

EXPLORE SPACE TECH

WITH SMALL SPACECRAFT

The Small Spacecraft Technology program expands the ability to execute unique missions through rapid development and demonstration of capabilities for small spacecraft applicable to exploration, science and the commercial space sector.

19 Spacecraft launched since 2015*

11 Spacecraft projected to launch in 2021*

Technologies used operationally for missions in Earth orbit and at Mars

* As of March 30, 2021



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THROUGH SUBORBITAL FLIGHT

The Flight Opportunities program rapidly demonstrates promising technologies for space exploration, discovery, and the expansion of space commerce through suborbital testing with industry flight providers.

212 successful suborbital flights since 2011* enabling 736 tests of payloads

31 suborbital flights projected for 2021*

Technologies used for missions in Earth orbit, at Mars, and soon to be on the Moon

* As of March 30, 2021



EXPLORE SPACE TECH

CHANGING THE PACE OF SPACE

Leveraging small spacecraft and responsive launch to rapidly expand space capabilities at dramatically lower costs

Rapid Leap from Lab to Orbit

Commercial suborbital and orbital test capabilities de-risking technology for future missions. Technology moves from lab to orbit in <9 months.

Expanded space commerce
On-orbit manufacturing, assembly, and inspection

Responsive deep space access

Sustained deep space presence
Commercial lunar activity
In-situ resource extraction and utilization

On-Demand Missions Beyond Earth

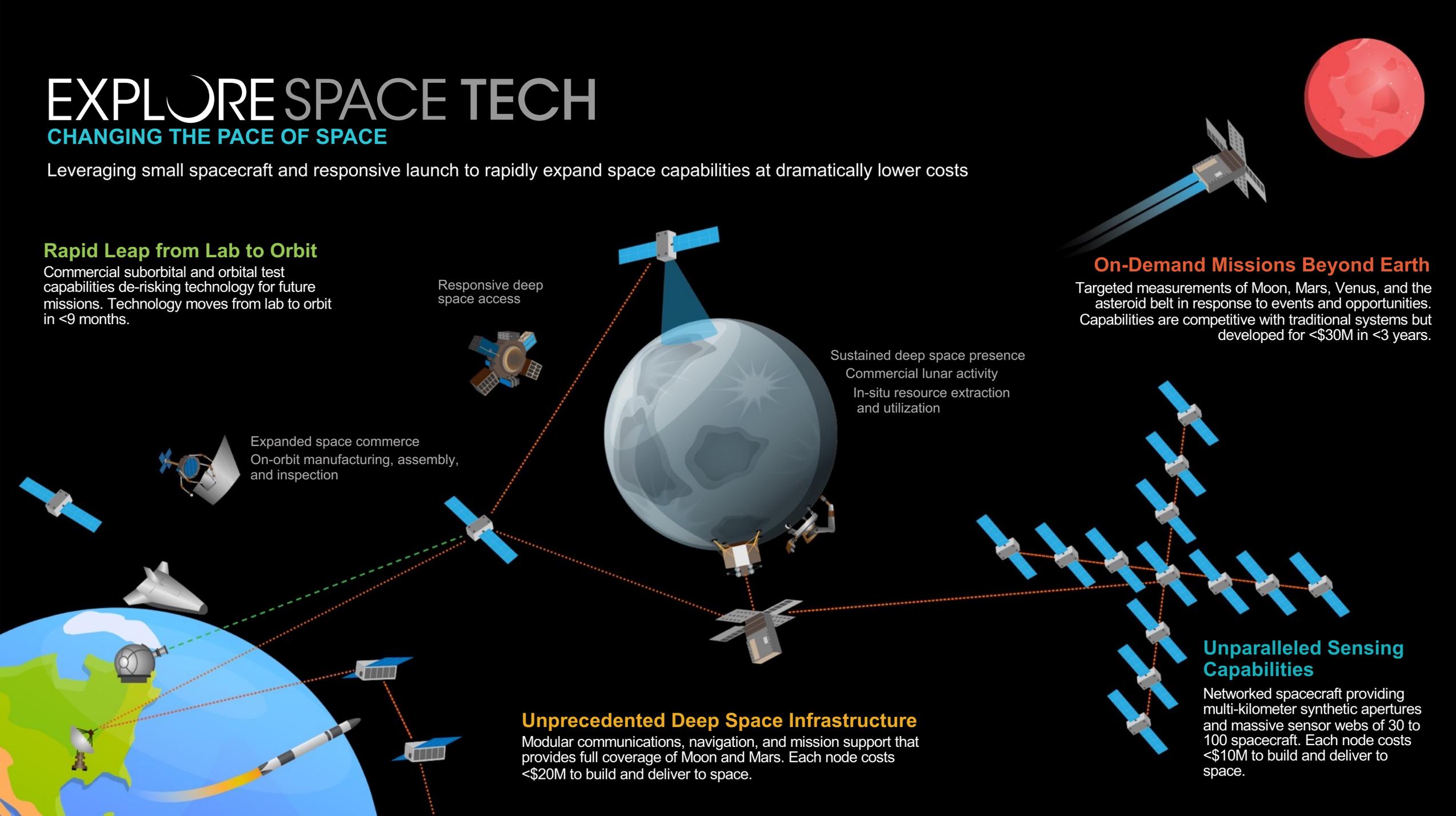
Targeted measurements of Moon, Mars, Venus, and the asteroid belt in response to events and opportunities. Capabilities are competitive with traditional systems but developed for <\$30M in <3 years.

Unprecedented Deep Space Infrastructure

Modular communications, navigation, and mission support that provides full coverage of Moon and Mars. Each node costs <\$20M to build and deliver to space.

Unparalleled Sensing Capabilities

Networked spacecraft providing multi-kilometer synthetic apertures and massive sensor webs of 30 to 100 spacecraft. Each node costs <\$10M to build and deliver to space.





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